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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/627,611

07/28/2003

Hiroshi Watanabe

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12/20/2005

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EXAMINER

KAO, CHIH CHENG G

ART UNIT

PAPER NUMBER

2882

DATE MAILED: 12/20/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	Application No. 10/627,611	Applicant(s) WATANABE ET AL.	
	Examiner Chih-Cheng Glen Kao	Art Unit 2882	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 17 November 2005.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 2-18 is/are pending in the application.  
4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 11-13 is/are allowed.
- 6) ☒ Claim(s) 2-10 and 14-18 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 17 November 2005 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☒ All    b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

## DETAILED ACTION

### *Drawings*

1. The drawings were received on 11/17/05. These drawings are acceptable.

### *Claim Objections*

2. Claim 9 is objected to because of the following informality, which appears to be a minor draft error. In the following format (location of objection; suggestion for correction), the following correction may obviate the objection: (claim 9, line 4, "transmitter. said"; replacing the period with a comma). For purposes of examination, the claim has been treated as such. Appropriate correction is required.

### *Claim Rejections - 35 USC § 112*

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

3. Claims 2-8 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

The subject matter not properly described in the application as filed includes “forming a laminated X-ray absorber on said surface of said X-ray transmitter, ... wherein said laminated X-ray absorber includes at least two layers having different compositions” as recited in claim 7. The specification only describes one layer on said surface of said X-ray transmitter as illustrated in figure 13, not a laminated X-ray absorber. Furthermore in relationship to figure 13, the specification on page 27, lines 1-2, recites, “Therefore, no layers may be formed as the first layers of the X-ray absorbers.” Since the application as originally filed did not provide any explicit support for “forming a laminated X-ray absorber on said surface of said X-ray transmitter, but not in said recesses, wherein said laminated X-ray absorber includes at least two layers having different composition”, claim 7 has been rejected for introducing new matter. Claims 2-6 and 8 are also rejected for the above reasons by virtue of their dependency.

### *Claim Rejections - 35 USC § 102*

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claims 5-7, 9, 10, 17, and 18 are rejected under 35 U.S.C. 102(b) as being anticipated by Miyake et al. (JP 09-043829).

5. Regarding claim 7, Miyake et al. discloses a method comprising etching (paragraph 23) an X-ray transmitter (fig. 2, #1) at a surface of said X-ray transmitter (fig. 2, #1) to form a

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plurality of recesses (fig. 2, #4) extending from the surface and into said X-ray transmitter (fig. 2, #1), leaving portions of the surface between respective parts of recesses (fig. 2, #4), and forming a laminated X-ray absorber (fig. 2, #2 and 3) on said surface of said X-ray transmitter (fig. 2, #1), but not in said recesses (fig. 2, #4), wherein said laminated X-ray absorber includes at least two layers having different compositions (fig. 2, #2 and 3).

6. Regarding claim 9, Miyake et al. discloses a method comprising forming an X-ray transmitter (fig. 2, #1), forming a first X-ray absorber (fig. 2, #3) opposite said X-ray transmitter (fig. 2, #1), said first X-ray absorber (fig. 2, #3) including a plurality of spaced apart first X-ray absorber portions having a first width (fig. 2, #3), and forming a second X-ray absorber (fig. 2, #2), on said first X-ray absorber (fig. 2, #3), said second X-ray absorber (fig. 2, #2) comprising a plurality of second X-ray absorber portions spaced from each other (fig. 2, #2), respectively disposed on corresponding first X-ray absorber portions (fig. 2, #3), and having a second width (fig. 2, #2), different from the first width (fig. 2, #3).

7. Regarding claims 5, 6, 17, and 18, Miyake et al. further discloses wherein said laminated X-ray absorber has a layer containing chromium (paragraph 19).

8. Regarding claim 10, Miyake et al. further discloses wherein the first width of said first X-ray absorber portions (fig. 2, #3) is larger than the second width of said second X-ray absorber portions (fig. 2, #2).

*Claim Rejections - 35 USC § 103*

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

9. Claims 2 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Miyake et al. as applied to claims 7 and 9 above, and further in view of Lee et al. (US Patent 6534221).

Miyake et al. discloses a method as recited above. Miyake et al. further discloses wherein said laminated X-ray absorber includes a first X-ray absorber (fig. 2, #3) opposite said X-ray transmitter (fig. 2, #1) and a second X-ray absorber (fig. 2, #2) in contact with said first X-ray absorber (fig. 2, #3), tungsten (paragraph 29) is employed as one of said first X-ray absorber and said second X-ray absorber, and carbon (paragraph 29) is employed as the other of said first X-ray absorber and second X-ray absorber.

However, Miyake et al. does not specifically disclose diamond as an absorber.

Lee et al. teaches diamond as an absorber (col. 5, lines 8-9).

It would have been obvious, to one having ordinary skill in the art at the time the invention was made, to incorporate the method of Miyake et al. with the diamond absorber of Lee et al., since one would be motivated to make such a modification for increasing the life of a device (col. 6, lines 29-31) as implied from Lee et al. Furthermore, it would have been obvious and within the general skill of a worker in the art to select a known material on the basis of its suitability.

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10. Claims 3 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Miyake et al. as applied to claims 7 and 9 above, and further in view of Maehara et al. (US Patent 5870448).

Miyake et al. discloses a method as recited above. Miyake et al. further discloses wherein said laminated X-ray absorber includes a first X-ray absorber (fig. 2, #3) on said X-ray transmitter (fig. 2, #1) and a second X-ray absorber (fig. 2, #2) on said first X-ray absorber.

However, Miyake et al. does not specifically disclose forming an etching stopper film, stopping etching when etching a first X-ray absorber on an X-ray transmitter, and forming a second X-ray absorber on said etching stopper film.

Maehara et al. teaches forming an etching stopper film (fig. 1f, #104a), stopping etching when etching a first X-ray absorber (fig. 1f, #105b) on an X-ray transmitter (figs. 1a and 1f, #102), and forming a second X-ray absorber (fig. 1f, #106b) on said etching stopper film (fig. 1f, #104a).

It would have been obvious, to one having ordinary skill in the art at the time the invention was made, to incorporate the method of Miyake et al. with the etching stopping film of Maehara et al., since one would be motivated to make such a modification for protecting the X-ray transmitter (figs. 1A-1L) as implied from Maehara et al.

11. Claims 4 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Miyake et al. as applied to claims 7 and 9 above, and further in view of Sentoku et al. (US Patent 5553110).

Miyake et al. discloses a method as recited above. Miyake et al. further discloses wherein said laminated X-ray absorber includes a first X-ray absorber (fig. 2, #3) on said X-ray transmitter (fig. 2, #1) and a second X-ray absorber (fig. 2, #2) on said first X-ray absorber.

However, Miyake et al. does not specifically disclose forming an interlayer film as an etching stopper or a hard mask on a first X-ray absorber, and forming a second X-ray absorber on said interlayer film.

Sentoku et al. teaches forming an interlayer film (fig. 13f, #164) as an etching stopper or a hard mask on a first X-ray absorber (fig. 13f, #163), and forming a second X-ray absorber (fig. 13f, #165) on said interlayer film (fig. 13f, #164).

It would have been obvious, to one having ordinary skill in the art at the time the invention was made, to incorporate the method of Miyake et al. with the interlayer film of Sentoku et al., since one would be motivated to make such a modification for lowering noise (col. 21, lines 13-15) as implied from Sentoku et al.

12. Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Miyake et al. as applied to claim 7 above, and further in view of Zapka et al. (US Patent 4855197).

Miyake et al. discloses a method as recited above.

However, Miyake et al. does not specifically disclose implanting ions before forming a removed portion.

Zapka et al. teaches implanting ions before (col. 7, lines 15-22) forming a removed portion (fig. 2, #5).



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It would have been obvious, to one having ordinary skill in the art at the time the invention was made, to incorporate the method of Miyake et al. with the implantation of ions of Zapka et al., since one would be motivated to make such a modification for making a stronger mask (abstract, lines 4-7) as shown by Zapka et al.

### *Allowable Subject Matter*

13. Claims 11-13 contain allowable subject matter. The following is a statement of reasons for the indication of allowable subject matter.

Regarding claim 11, prior art does not disclose or fairly suggest a method including carrying out an exposure with an X-ray mask having a geometric X-ray phase difference between a phase of X-rays transmitted through an X-ray transmission part of said X-ray mask and a phase of X-rays transmitted through an X-ray absorber of said X-ray mask in a range including  $0.5\pi$  and in proximity to  $0.5\pi$ , wherein a laminated structure includes at least two layers having different compositions, and either a phase shift of the X-rays transmitted through said X-ray absorber is in a range of  $0.3\pi$  to  $0.6\pi$  or the transmittance of the X-rays transmitted through said X-ray absorber is in a range of 30% to 60%, in combination with all the limitations in the claim. Claims 12 and 13 contain allowable subject matter by virtue of their dependency.

### *Response to Arguments*

14. Applicant's arguments with respect to claims 2-10 and 14-18 have been considered but are moot in view of the new ground(s) of rejection.

***Terminal Disclaimer***

15. The terminal disclaimer filed on 11/17/05 disclaiming the terminal portion of any patent granted on this application which would extend beyond the expiration date of US Patent 6898267 has been reviewed and is accepted. The terminal disclaimer has been recorded.

***Conclusion***

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Chih-Cheng Glen Kao whose telephone number is (571) 272-2492. The examiner can normally be reached on M - F (9 am to 5 pm).


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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ed Glick can be reached on (571) 272-2490. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



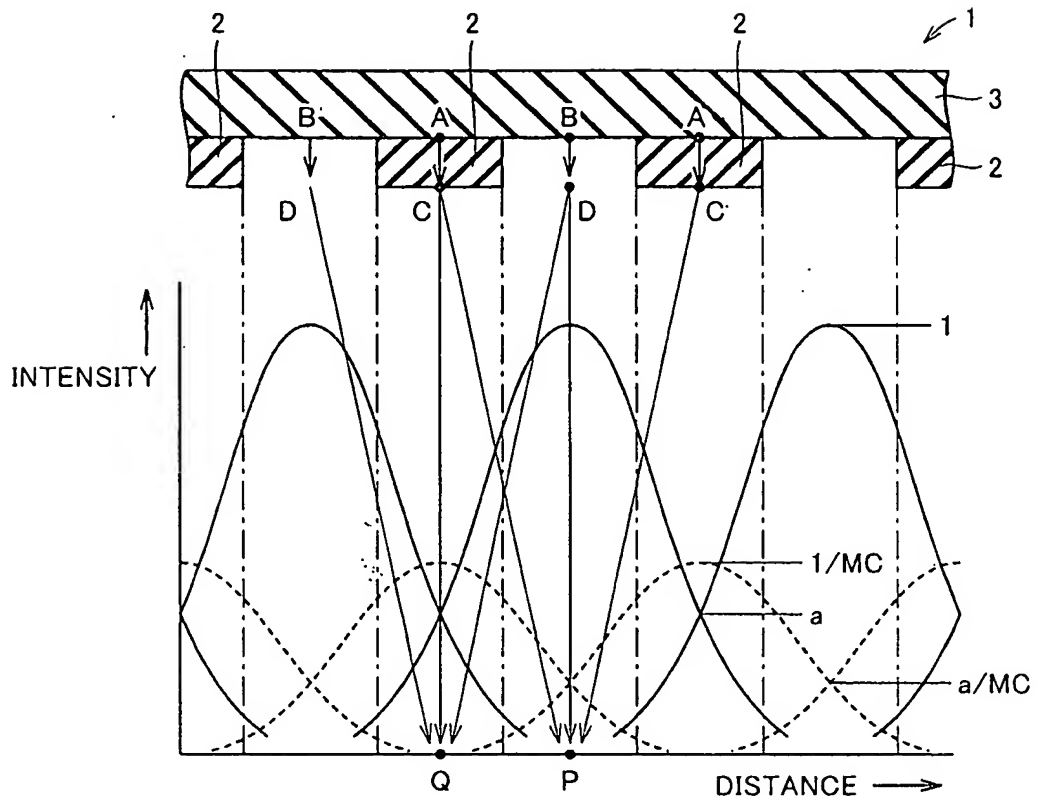
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**EDWARD J. GLICK**  
**SUPERVISORY PATENT EXAMINER**



FIG.1



Approved  
12/10/05